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☐ 1. Document ID: US 6703319 B1

L6: Entry 1 of 13

File: USPT

Mar 9, 2004

US-PAT-NO: 6703319

DOCUMENT-IDENTIFIER: US 6703319 B1

TITLE: Compositions and methods for removing etch residue

DATE-ISSUED: March 9, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Yates; Donald L.	Boise	ID		
Westmoreland; Donald L.	Boise	ID		

US-CL-CURRENT: 438/745; 252/79.1, 252/79.3, 252/79.4

ABSTRACT:

A composition suitable for cleaning and methods of cleaning etch residue are provided. The composition includes at least one source of a fluoride ion and at least one organic solvent.

44 Claims, 4 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 2

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KUMC	Draw De
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☐ 2. Document ID: US 6530995 B2

L6: Entry 2 of 13

File: USPT

Mar 11, 2003

US-PAT-NO: 6530995

DOCUMENT-IDENTIFIER: US 6530995 B2

**** See image for Certificate of Correction ****

TITLE: Processing compositions and methods of using same

DATE-ISSUED: March 11, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Vaartstra; Brian A.	Nampa	ID		

US-CL-CURRENT: 134/3; 257/E21.228, 438/633, 438/692, 510/175, 510/176, 510/177, 510/178

ABSTRACT:

Compositions and methods for processing (e.g., cleaning) substrates, such as semiconductor-based substrates, as well as processing equipment, include one or more compounds of Formula (I): ##STR1##

wherein each R.sup.1, R.sup.2, R.sup.3, and R.sup.4 is independently H or an organic group.

16 Claims, 4 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 2

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMIC	Drawing
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3. Document ID: US 6509272 B2

L6: Entry 3 of 13

File: USPT

Jan 21, 2003

US-PAT-NO: 6509272

DOCUMENT-IDENTIFIER: US 6509272 B2

**** See image for Certificate of Correction ****

TITLE: Planarization method using fluid composition including chelating agents

DATE-ISSUED: January 21, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Skrovan; John	Boise	ID		
Meikle; Scott	Boise	ID		

US-CL-CURRENT: 438/692; 216/88, 216/89, 257/E21.23, 438/693

ABSTRACT:

A planarization method including the provision of a wafer having a wafer surface. A pad is positioned for contact with the wafer surface and the wafer surface is planarized using the pad and a fluid composition that includes a chelating agent. The chelating agent is a water soluble multidentate chelating agent, preferably a water soluble bidentate ionic chelating agent, and more preferably 1,2-ethylenediphosphonic acid (EDP). A fluid composition for use in planarization of a surface of a wafer includes a chemically interactive component that interacts with the surface of the wafer and a chelating agent for reducing the metal ion contamination of the wafer during planarization. The chelating agent may be one of a water soluble multidentate chelating agent, preferably a water soluble bidentate

ionic chelating agent, and more preferably 1,2-ethylenediphosphonic acid (EDP). Further, the fluid composition may include an abrasive component.

8 Claims, 20 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 17

Full	Title	Citation	Front	Review	Classification	Date	Reference				Claims	KWIC	Draw D
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☐ 4. Document ID: US 6468909 B1

L6: Entry 4 of 13

File: USPT

Oct 22, 2002

US-PAT-NO: 6468909

DOCUMENT-IDENTIFIER: US 6468909 B1

**** See image for Certificate of Correction ****

TITLE: Isolation and/or removal of ionic contaminants from planarization fluid compositions using macrocyclic polyethers and methods of using such compositions

DATE-ISSUED: October 22, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Marshall; Brian K.	Boise	ID		

US-CL-CURRENT: 438/691; 438/692, 438/693, 438/694, 438/700

ABSTRACT:

The present invention provides fluid compositions for use in the planarization of a substrate surface. Fluid compositions include a planarization slurry having an abrasive component and a chemically interactive component and an effective amount of at least one crown ether that is capable of isolating at least one charged ion contaminant specie in the planarization slurry. Also included are fluid compositions that are pre-treated with an effective amount of at least one crown ether to remove one or more charged ion contaminants in the fluid composition utilized in a planarization process. Methods of using the fluid compositions are also provided.

37 Claims, 8 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 3

Full	Title	Citation	Front	Review	Classification	Date	Reference				Claims	KWIC	Draw D
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☐ 5. Document ID: US 6458290 B1

L6: Entry 5 of 13

File: USPT

Oct 1, 2002

US-PAT-NO: 6458290

DOCUMENT-IDENTIFIER: US 6458290 B1

TITLE: Isolation and/or removal of ionic contaminants from planarization fluid compositions using macrocyclic polyethers

DATE-ISSUED: October 1, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Marshall; Brian K.	Boise	ID		

US-CL-CURRENT: 252/79.1; 252/79.4

ABSTRACT:

The present invention provides fluid compositions for use in the planarization of a substrate surface. Fluid compositions include a planarization slurry having an abrasive component and a chemically interactive component and an effective amount of at least one crown ether that is capable of isolating at least one charged ion contaminant specie in the planarization slurry. Also included are fluid compositions that are pre-treated with an effective amount of at least one crown ether to remove one or more charged ion contaminants in the fluid composition utilized in a planarization process. Methods of using the fluid compositions are also provided.

25 Claims, 8 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 3

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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☐ 6. Document ID: US 6375754 B1

L6: Entry 6 of 13

File: USPT

Apr 23, 2002

US-PAT-NO: 6375754

DOCUMENT-IDENTIFIER: US 6375754 B1

TITLE: Processing compositions and methods of using same

DATE-ISSUED: April 23, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Vaartstra; Brian A.	Nampa	ID		

US-CL-CURRENT: 134/2; 257/E21.228, 438/691, 510/175

ABSTRACT:

Compositions and methods for processing (e.g., cleaning) substrates, such as semiconductor-based substrates, as well as processing equipment, include one or more compounds of Formula (I): ##STR1##

wherein each R.sup.1, R.sup.2, R.sup.3, and R.sup.4 is independently H or an organic group.

25 Claims, 4 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 2

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KUMC	Draw D
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☐ 7. Document ID: US 6280924 B1

L6: Entry 7 of 13

File: USPT

Aug 28, 2001

US-PAT-NO: 6280924

DOCUMENT-IDENTIFIER: US 6280924 B1

TITLE: Planarization method using fluid composition including chelating agents

DATE-ISSUED: August 28, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Skrovan; John	Boise	ID		
Meikle; Scott	Boise	ID		

US-CL-CURRENT: 438/692; 216/88, 216/89, 257/E21.23, 438/693

ABSTRACT:

A planarization method including the provision of a wafer having a wafer surface. A pad is positioned for contact with the wafer surface and the wafer surface is planarized using the pad and a fluid composition that includes a chelating agent. The chelating agent is a water soluble multidentate chelating agent, preferably a water soluble bidentate ionic chelating agent, and more preferably 1,2-ethylenediphosphonic acid (EDP). A fluid composition for use in planarization of a surface of a wafer includes a chemically interactive component that interacts with the surface of the wafer and a chelating agent for reducing the metal ion contamination of the wafer during planarization. The chelating agent may be one of a water soluble multidentate chelating agent, preferably a water soluble bidentate ionic chelating agent, and more preferably 1,2-ethylenediphosphonic acid (EDP). Further, the fluid composition may include an abrasive component.

5 Claims, 20 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 17

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KUMC	Draw D
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☐ 8. Document ID: US 6207630 B1

L6: Entry 8 of 13

File: USPT

Mar 27, 2001

US-PAT-NO: 6207630

DOCUMENT-IDENTIFIER: US 6207630 B1

TITLE: Processing compositions and methods of using same

DATE-ISSUED: March 27, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Vaartstra; Brian A.	Nampa	ID		

US-CL-CURRENT: 510/175; 257/E21.228, 438/633, 438/692

ABSTRACT:

Compositions and methods for processing (e.g., cleaning) substrates, such as semiconductor-based substrates, as well as processing equipment, include one or more compounds of Formula (I): ##STR1##

wherein each R.sup.1, R.sup.2, R.sup.3, and R.sup.4 is independently H or an organic group.

20 Claims, 4 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 2

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw D
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☐ 9. Document ID: US 6136218 A

L6: Entry 9 of 13

File: USPT

Oct 24, 2000

US-PAT-NO: 6136218

DOCUMENT-IDENTIFIER: US 6136218 A

TITLE: Planarization fluid composition including chelating agents

DATE-ISSUED: October 24, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Skrovan; John	Boise	ID		
Meikle; Scott	Boise	ID		

US-CL-CURRENT: 252/79.1; 252/79.2, 252/79.3, 252/79.4, 252/79.5

ABSTRACT:

A planarization method including the provision of a wafer having a wafer surface. A pad is positioned for contact with the wafer surface and the wafer surface is

planarized using the pad and a fluid composition that includes a chelating agent. The chelating agent is a water soluble multidentate chelating agent, preferably a water soluble bidentate ionic chelating agent, and more preferably 1,2-ethylenediphosphonic acid (EDP). A fluid composition for use in planarization of a surface of a wafer includes a chemically interactive component that interacts with the surface of the wafer and a chelating agent for reducing the metal ion contamination of the wafer during planarization. The chelating agent may be one of a water soluble multidentate chelating agent, preferably a water soluble bidentate ionic chelating agent, and more preferably 1,2-ethylenediphosphonic acid (EDP). Further, the fluid composition may include an abrasive component.

9 Claims, 20 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 17

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw D
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☐ 10. Document ID: US 6060395 A

L6: Entry 10 of 13

File: USPT

May 9, 2000

US-PAT-NO: 6060395

DOCUMENT-IDENTIFIER: US 6060395 A

TITLE: Planarization method using a slurry including a dispersant

DATE-ISSUED: May 9, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Skrovan; John	Boise	ID		
Robinson; Karl M.	Boise	ID		

US-CL-CURRENT: 438/692; 257/E21.244, 438/693

ABSTRACT:

A planarization method includes providing a wafer surface and positioning a pad for contact with the wafer surface. The wafer surface is then planarized using the pad and a slurry. The slurry includes a dispersant which is one of any micellar forming surfactants. Preferably, the dispersant is a diprotic acid having 6 or less carbons connecting the acid groups, more preferably a diphosphonic acid with 4 or less carbon atoms connecting the acid groups, and most preferably is 1,2-ethylenediphosphonic acid (EDP). The wafer surface may be either a nonplanar or a substantially planar wafer surface. Another slurry that can be used in the method includes a slurry component including an abrasive component and a chemically interactive component that interacts with the surface. The slurry component when used alone in a planarization of the surface results in a surface thickness uniformity having a first standard deviation and a first rate of removal of material from the surface. The slurry further includes a dispersant component of a quantity sufficient to reduce the first standard deviation to a second standard deviation lower than the first standard deviation when the planarization of the surface is performed with the slurry including the slurry component and the dispersant component. The planarization of the surface performed with the slurry

including the slurry component and the dispersant component has a second rate of removal substantially equivalent to the first rate of removal.

9 Claims, 4 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 1

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De
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METALLICS	1099
CONTAMINANT	27525
CONTAMINANTS	89185
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☐ 11. Document ID: US 6030491 A

L6: Entry 11 of 13

File: USPT

Feb 29, 2000

US-PAT-NO: 6030491

DOCUMENT-IDENTIFIER: US 6030491 A

TITLE: Processing compositions and methods of using same

DATE-ISSUED: February 29, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Vaartstra; Brian A.	Nampa	ID		

US-CL-CURRENT: 216/79, 257/E21.228, 510/175, 510/499, 510/504

ABSTRACT:

Compositions and methods for processing (e.g., cleaning) substrates, such as semiconductor-based substrates, as well as processing equipment, include one or more compounds of Formula (I): ##STR1## wherein each R.sup.1, R.sup.2, R.sup.3, and R.sup.4 is independently H or an organic group.

21 Claims, 4 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 2

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KUIC	Draw Ds
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☐ 12. Document ID: US 5916819 A

L6: Entry 12 of 13

File: USPT

Jun 29, 1999

US-PAT-NO: 5916819

DOCUMENT-IDENTIFIER: US 5916819 A

TITLE: Planarization fluid composition chelating agents and planarization method using same

DATE-ISSUED: June 29, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Skrovan; John	Boise	ID		
Meikle; Scott	Boise	ID		

US-CL-CURRENT: 438/692; 216/89, 257/E21.23, 438/693

ABSTRACT:

A planarization method including the provision of a wafer having a wafer surface. A pad is positioned for contact with the wafer surface and the wafer surface is planarized using the pad and a fluid composition that includes a chelating agent. The chelating agent is a water soluble multidentate chelating agent, preferably a water soluble bidentate ionic chelating agent, and more preferably 1,2-ethylenediphosphonic acid (EDP). A fluid composition for use in planarization of a surface of a wafer includes a chemically interactive component that interacts with the surface of the wafer and a chelating agent for reducing the metal ion contamination of the wafer during planarization. The chelating agent may be one of a water soluble multidentate chelating agent, preferably a water soluble bidentate ionic chelating agent, and more preferably 1,2-ethylenediphosphonic acid (EDP). Further, the fluid composition may include an abrasive component.

5 Claims, 20 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 17

Full	Title	Citation	Front	Review	Classification	Date	Reference		Claims	KMC	Draw De
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13. Document ID: US 5827781 A

L6: Entry 13 of 13

File: USPT

Oct 27, 1998

US-PAT-NO: 5827781

DOCUMENT-IDENTIFIER: US 5827781 A

TITLE: Planarization slurry including a dispersant and method of using same

DATE-ISSUED: October 27, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Skrovan; John	Boise	ID		
Robinson; Karl M.	Boise	ID		

US-CL-CURRENT: 438/692; 257/E21.244, 438/693

ABSTRACT:

A planarization method includes providing a wafer surface and positioning a pad for contact with the wafer surface. The wafer surface is then planarized using the pad and a slurry. The slurry includes a dispersant which is one of any micellar forming surfactants. Preferably, the dispersant is a diprotic acid having 6 or less carbons connecting the acid groups, more preferably a diphosphonic acid with 4 or less carbon atoms connecting the acid groups, and most preferably is 1,2-

ethylenediphosphonic acid (EDP). The wafer surface may be either a nonplanar or a substantially planar wafer surface. Another slurry that can be used in the method includes a slurry component including an abrasive component and a chemically interactive component that interacts with the surface. The slurry component when used alone in a planarization of the surface results in a surface thickness uniformity having a first standard deviation and a first rate of removal of material from the surface. The slurry further includes a dispersant component of a quantity sufficient to reduce the first standard deviation to a second standard deviation lower than the first standard deviation when the planarization of the surface is performed with the slurry including the slurry component and the dispersant component. The planarization of the surface performed with the slurry including the slurry component and the dispersant component has a second rate of removal substantially equivalent to the first rate of removal.

25 Claims, 4 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 1

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KINC	Draw De
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